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Tomato Leaf DHS cDNA sequence

CGCAGAAACTCGCGGCGCAGTCTTGTTCCGTACATAATCTTGGTCTGCAATAATGGGAGAAGCTCTGAAGTACAGTATCATGGAC
M G E A L K Y S I M D

TCAGTAAGATCGGTAGTTTTCAAGAATCCGAAAATCTAGAAGGTTCTTGCACTAAAATCGAGGGCTACGACTTCAATAAAGGCGT
S V R S V V F K E S E N L E G S C T K I E G Y D F N K G V

TAACATGCTGAGCTGATCAAGTCCATGGTTCACCTGGTTCCTCAAGCATCTAATCTTGGTGACGCCATTGCAATTGTTAATCAAA
N Y A E L I K S M V S T G F Q A S N L G D A I A I V N Q

TGCTAGATTGGAGGCTTTCACATGAGCTGCCACGGAGGATTGCAGTGAAGAAGAAAGAGATGTTGCATACAGAGAGTCGGTAACC
M L D W R L S H E L P T E D C S E E R D V A Y R E S V T

TGCAAAATCTCTTGGGGTTCACCTTCAAACCTTGTTCTTCCTGGTGTAGAGACACTGTCCGCTACCTTGTTCAGCACCGGATGGT
C K I F L G F T S N L V S S G V R D T V R Y L V Q H R M V

TGATGTTGTGGTTACTACAGCTGGTGTATTGAAGAGGATCTCATAAAGTGCCTCGCACCAACCTACAAGGGGACTTCTCTTTAC
D V V V T T A G G I E E D L I K C L A P T Y K G D F S L

CTGGAGCTTCTCTACGATCGAAAGGATTGAACCGTATTGGTAACCTTATGGTTCCTAATGACAACTACTGCAAAATTTGAGAATTGG
P G A S L R S K G L N R I G N L L V P N D N Y C K F E N W

ATCATCCCAGTTTTGACCAAAATGTATGAGGAGCAGATTAAATGAGAAGGTTCTATGGACACCATCTAAAGTCATTGCTCGTCTGGG
I I P V F D Q M Y E E Q I N E K V L W T P S K V I A R L G

FIG.1A



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TAAAGAAATTAATGATGAACCTCATACTTGATTGGGCTTACAAGAACCGGATTCTCTGCTCTCTGCTGGCTTGACGGATGGAT
K E I N D E T S Y L Y W A Y K N R I P V F C P G L T D G

CACTTGGTGACATGCTATACTTCCATTCTTTCAAAAAGGGTGATCCAGATAATCCAGATCTTAATCCTGGTCTAGTCATAGACATT
S L G D M L Y F H S F K K G D P D N P D L N P G L V I D I

GTAGGAGATATTAGGGCCCATGAATGGTGAAGCTGTCCATGCTGGTTTGAGGAAGACAGGAATGATTATACTGGGTGGAGGGCTGCC
V G D I R A M N G E A V H A G L R K T G M I I L G G G L P

TAAGCACCATGTTTGAATGCCAATATGATGCGCAATGGTGCGAGATTTTGCCGCTTCATTAAACCCGCACAGAGTTTGATGGTA
K H H V C N A N M M R N G A D F A V F I N T A Q E F D G

GTGACTCTGGTCCCGCTCTGATGAAGCTGTATCATGGGGAAAGATACGTGGTGGTGCCCAAGACTGTGAAGGTGCATTGTGATGCA
S D S G A R P D E A V S W G K I R G G A K T V K V H C D A

ACCATTGCATTTCCCATATTAGTAGCTGAGACATTTGCAGCTAAGAGTAAGGAATTCCTCCAGATAAGGTGCCAAGTTTGAACATT
T I A F P I L V A E T F A A K S K E F S Q I R C Q V

GAGGAAGCTGTCTCCGACCACACATATGAATTGCTAGCTTTTGAAGCCAACTTGCTAGTGTGCAGCACCATTATTCTGCAAAA
CTGACTAGAGAGCAGGGTATATTCCTCTACCCCGAGTTAGACGACATCCTGTATGGTTCAAATTAATTTTCTCCCTTCACA
CCATGTTATTAGTTCTCTCTCGAAAGTGAAGAGCTTAGATGTTTCATAGGTTTGAATTTATGTTGGAGGTTGGTGATAACT
GACTAGTCCTCTTACCATATAGATAATGTATCCTTGTAATGAGATTTTGGGTGTGTTTGATACCAAGGAAAAATGTTTATTGG
AAAACAATTGGATTTTAAATTTATTTTCTGTTT

FIG.1B



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Arabidopsis DeoxyHypusine Synthase
(DHS) Predicted Sequence

GAAC^MCCCCAAACCCTCTACTACTACACTTTTCAGATCCAAGGAAATCAATTTTGTCAATTCGAGCAACATGG
AGGATGATCGTGT^MTTTTCTCTTCGGTTCACTCAACAGTTTTCAAAGAATCCGAATCATTGGAAGGAAAGTGT
E D D R V F S S V H S T V F K E S E S L E G K C
GATAAAATCGAAGGATACGATTTCAATCAAGGAGTAGATTACCCAAAGCTTATGCGATCCATGCTCACCAC
D K I E G Y D F N Q G V D Y P K L M R S M L T T
CGGATTTCAAGCCTCGAATCTCGGCCAAGCTATTGATGTCGTCAATCAAATGGTTCGTTTCTCGAATTCAT
G F Q A S N L G E A I D V V N Q M
CAAAAAATAAAATTCCTTCTTTTGT^{F E F}TTTCTTTGTTTGGGTGAATTAGTAATGACAAAGAGTTTGAATT
TGTATTGAAGCTAGATTGGAGACTGGCTGATGAACTACAGTAGCTGAAGACTGTAGTGAAGAGGAGAAGA
V L K L D W R L A D E T T V A E D C S E E E K
ATCCATCGTTTAGAGAGTCTGTCAAGTGTAAATCTTTCTAGGTTTCACTTCAAATCTTGTTCATCTGGT
N P S F R E S V K C K I F L G F T S N L V S S G
GTTAGAGATACTATTCTGTTATCTTGTTCAGCATCATATGGTTTGTGATTTTGTCTTTATCACCTGCTTTT
V R D T I R Y L V Q H H M
TTATAGATGTAAATTTTTCGAGCTTTAGTTTGTATTCAATGGTTTTTCTGCAGGTTGATGTTATAGTCA
V D V I V
CGACAAC^{V D V I V}TGGTGGTGTGAGGAAGATCTCATAAAATGCCTTGCACCTACATTTAAAGGTGATTTCTCTCTA
T T T G G V E E D L I K C L A P T F K G D F S L
CCTGGAGCTTATTTAAGGTCAAAGGGATTGAACCGAATTGGGAATTTGCTGGTTCCTAATGATAACTACTG
P G A Y L R S K G L N R I G N L L V P N D N Y C
CAAGTTTGAGGATTGGATCATTCCCATCTTTGACGAGATGTTGAAGGAACAGAAAGAAGAGGTATTGCTTT
K F E D W I I P I F D E M L K E Q K E E
ATCTTTCTTTTATATGATTTGAGATGATTCTGTTTGTGCGTCACTAGTGGAGATAGATTTTGATTCCTC
TCTTGCATCATTGACTTCGTTGGTGAATCCTTCTTCTGCTGTTTTTCTTGTAGAATGTGTTGTGGACTC
N V L W T
CTTCTAAACTGTTAGCACGGCTGGGAAAAGAAATCAACAATGAGAGTTCATACCTTTATTGGGCATACAAG
P S K L L A R L G K E I N N E S S Y L Y W A Y K
GTATCCAAAATTTTAACCTTTTATGTTTTTAAATCATCCTGTGAGGAAC^{N V L W T}CGGGGATTTAAATTTTCCGCT
TCTTGTGGTGTGTGATGATGAATATTCCAGTATTCTGCCAGGGTTAACAGATGGCTCTCTTGGGGATATG
M N I P V F C P G L T D G S L G D M
CTGTATTTTCACTCTTTTCTGACCTCTGGCCTCATCATCGATGTAGTACAAGGTACTTCTTTTACTCAATA
L Y F H S F R T S G L I I D V V Q
AGTCAGTGTGATAAATATTCTGCTACATCTAGTGCAGGAATATTGTAAGTGTAGTGCATTGTAGCTTTT
CCAATTCAGCAACGGACTTTACTGTAAGTTGATATCTAAAGGTTCAAACGGGAGCTAGGAGAATAGCATAG
GGGCATTCTGATTTAGGTTTGGGGCACTGGGTAAAGAGTTAGAGAATAATAATCTTGTAGTTGTTTATCA
AACTCTTTGATGGTTAGTCTCTTGGTAATTTGAATTTATCACAGTGTATGCTTTGAACCAAGTTAAT
GTTTTATGAACAGATATCAGAGCTATGAACGGCGAAGCTGTCCATGCAAATCCTAAAAAGACAGGGATGAT
D I R A M N G E A V H A N P K K T G M I
AATCCTTGGAGGGGCTTGCCAAAGCACCATATGTAATGCCAATATGATGCGCAATGGTGCAGATTACG
I L G G G L P K H H I C N A N M M R N G A D Y
CTGTATTTATAAACACCGGGCAAGAATTTGATGGGAGCGACTCGGGTGCACGCCCTGATGAAGCCGTGTCT
A V F I N T G Q E F D G S D S G A R P D E A V S
TGGGGTAAATTAGGGGTTCTGCTAAAACCGTTAAGGTCTGCTTTTAAATTTCTTACATCCTAATTTATA
W G K I R G S A K T V K V C F L I S S H P N L Y
TCTCACTCAGTGGTTTTGAGTACATATTTAATATTGGATCATTCTTGCAGGTATACTGTGATGCTACCATA
L T Q W F
GCCTTCCCATTGTTGGTTGCAGAAACATTTGCCACAAAGAGAGACCAAACCTGTGAGTCTAAGACTTAAGA
ACTGACTGGTCGTTTTGGCCATGGATTCTTAAAGATCGTTGCTTTTTGATTTTACTGAGGTGACCATAT
AACACTCCACATTGATGTGGCTGTGACGCGAATTGTCTTCTTGCGAATTGTACTTTAGTTTCTCTCAACCT
AAAATGATTTGCAGATTGTGTTTTCGTTTAAACACAAGAGTCTTGTAGTCAATAATCCTTTCCTTATAA
AATTATTCAGTTCCAACAACACATTGTGATTCTGTGACAAGTCTCCCGTTGCCTATGTTCACTTCTCTGCG

FIG.2A



MEDDRVFSVHSTVFKESLEGGKCDKIEGYDFNQVDYPKLMRSMMLTTGFQASNLGEAIDVVNQMFVVLKLDWRLADETTV
AEDCSEEEKNPSFRESVKCKIFLGFSTSNLVSSGVRTIRYL VQHMDVIVITTTGGVEEDLIKCLAPTFKGFSLPGAYLRSK
GLNRIGNLLVPNDNYCKFEDWIPIFDEMLKEQKEENVLWTPSKLLARLKEINNESSYLWAYKMNIPVFCPGLTDGSLGDM
LYFHSFRTSGLIIDVVQDIRAMNGEAVHANPKKTGMIILGGGLPKHHICNANMRNGADYAVFINTGQEFFDGS DSGARPDEAV
SWGKIRGSAKTVKVCFLISSHPNLYLTQMF

FIG.2B

GGTGGTGTGAGGAAGATCTCATAAATGCCCTTGCCACCTACATTTAAAGGTGATTTCTCTCTACCTGGAGCTTATTTAAG
GTCAAAGGGATTGAACCGAATTGGGAATTTGCTGGTTCCTAATGATAACTACTGCAAGTTTGAGGATTGGATCATTTCCCA
TCTTTGACGAGATGTTGAAGGAACAGAAAGAGAGATGTTGTGGACTCCTTCTAACTGTTAGCAGGCTGGGAAAA
GAAATCAACAATGAGAGTTACACCTTTATTGGGCATACAAGATGAATATTCAGTATTTCTGCCAGGGTTAACAGATGG
CTCTCTTAGGATATGCTGTATTTTCACTCTTTTCTGTAACCTCTGGCCTCATCATGATGTAGTACAAGATATCAGAGCTA
TGAACGGCGAAGCTGTCCATGCAATCCTAAAAAGACAGGGATGATAATCCTTGGAGGGGGCTTGCCAAAGCACCATATA
TGTAATGCCAATATGATGGCAATGGTGCAGATTACGCTGTATTTATAAACACCCGGGCAAGAATTTTGATGGGAGCGGACTC
GGGTGCACGCCCTGATGAAGC

FIG.2C

GGVEEDLIKCLAPTFKGFSLPGAYLRSKGLNRIGNLLVPNDNYCKFEDWIPIFDEMLKEQKEENVLWTPSKLLARLKEIN
NESSYLWAYKMNIPVFCPGLTDGSLRDMLYFHSFRTSGLIIDVVQDIRAMNGEAVHANPKKTGMIILGGGLPKHHICNANMM
RNGADYAVFINTGQEFFDGS DSGARPDE

FIG.2D



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Multiple DHS Sequence Alignments of
Human, Arabidopsis, Tomato, Yeast, Neurospora (Fungi), and
Methanococcus (Archaeobacteria)

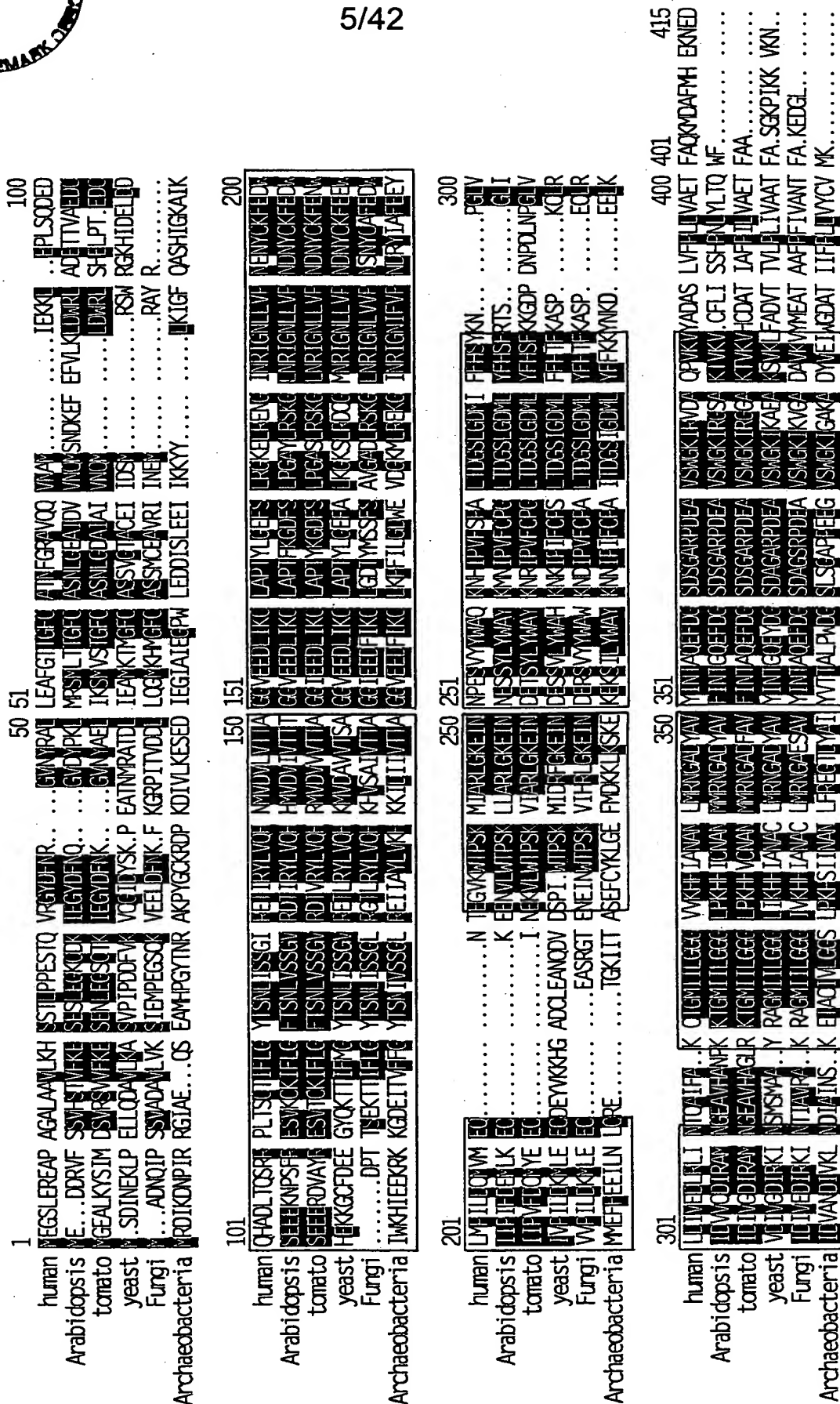


FIG.3

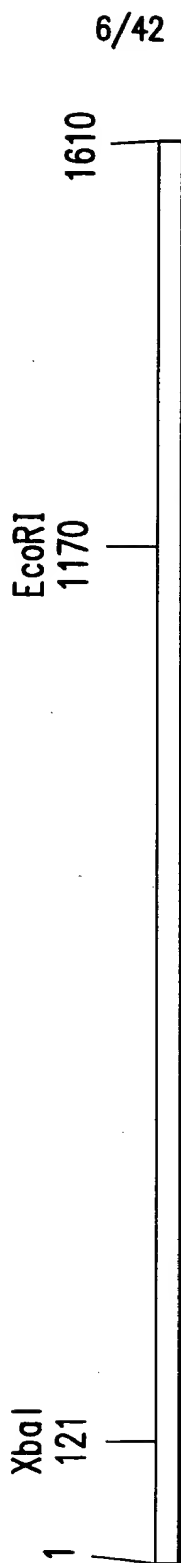


FIG.4



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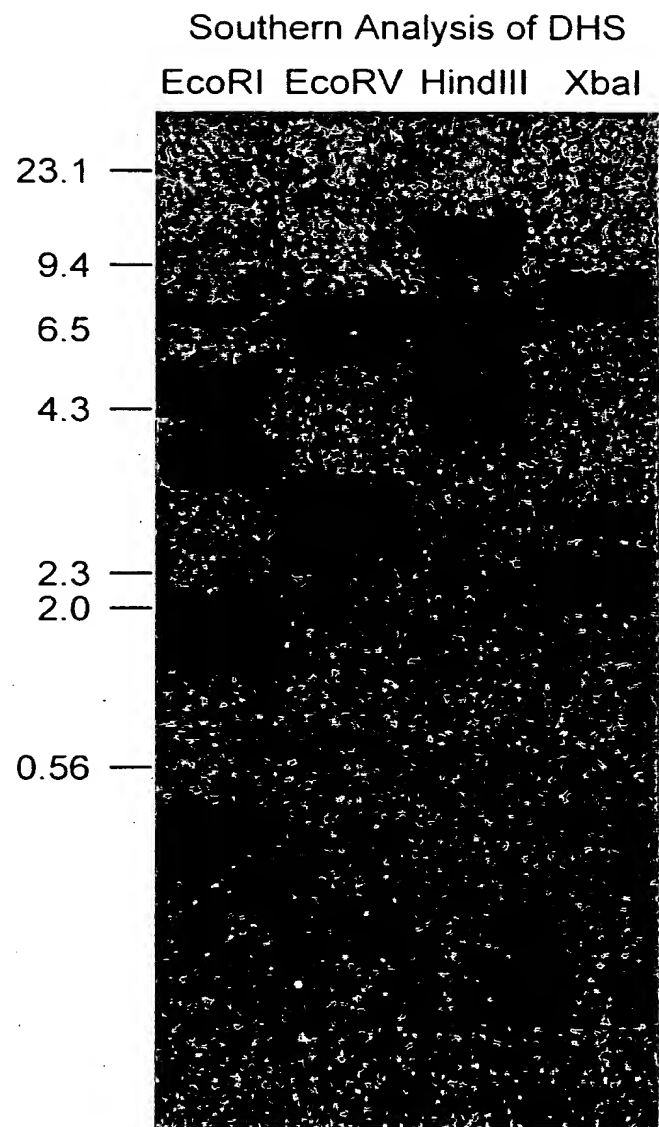


FIG.5



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Northern analysis of DHS on
tomato flowers

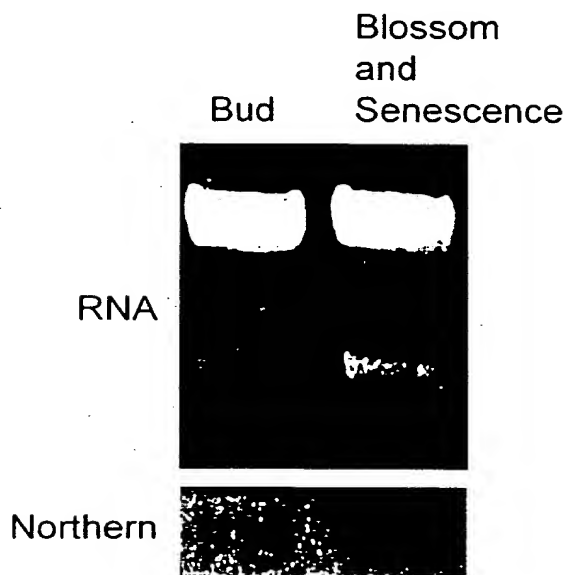


FIG.6



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NORTHERN ANALYSIS OF DHS
ON DEVELOPMENTAL STAGES OF
TOMATO FRUIT

BREAKER PINK

RIPE
(RED)

NORTHERN
BLOT



FIG.7



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Northern Analysis of DHS – 2M
Sorbitol treated Tomato Leaves

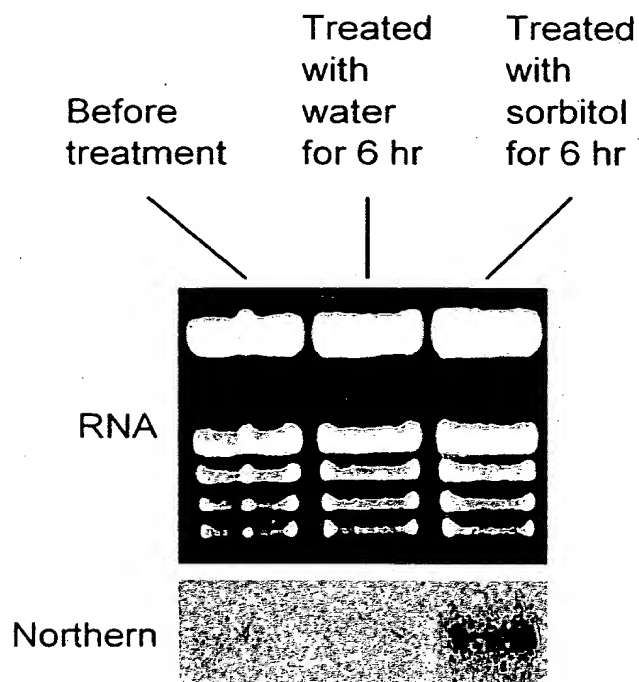


FIG.8



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NORTHERN ANALYSIS OF DHS TOMATO LEAF CHILLING EFFECTS

CHILLING 3 DAYS,
REWARM 1 DAY,
BEFORE CHILLING 2 DAYS CHILLING 2 DAYS CHILLING 6 DAYS
CHILLING REWARMING (hr) REWARMING (hr) REWARMING (hr)
0 6 24 0 6 24 0 6 24



FIG.9A

Northern



FIG.9B

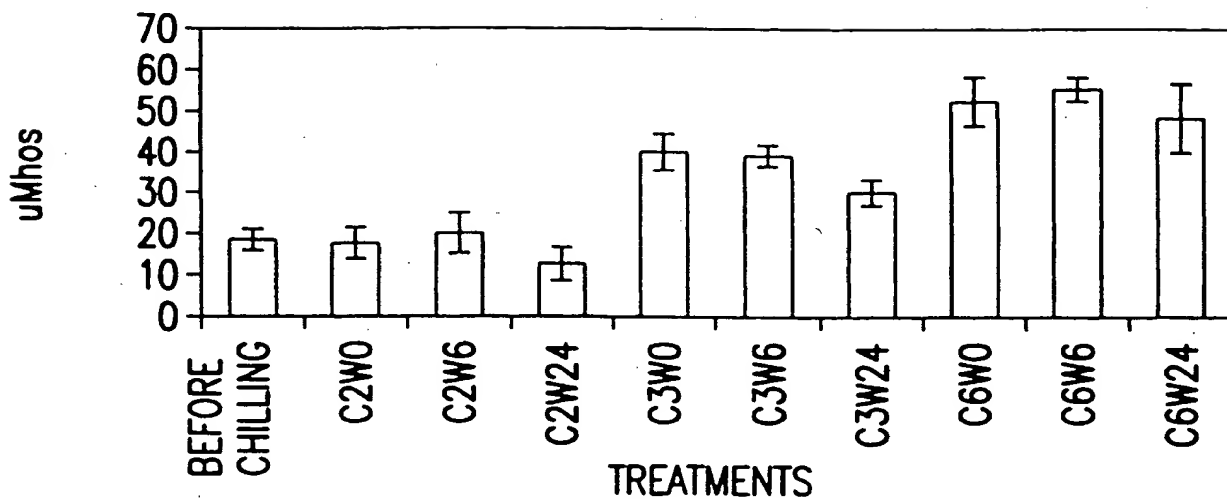


FIG.9C



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Canation DHS cDNA Sequence

GTCATTACAATGCATAGGATCATTGCACATGCTACCTTCCTCATTGCACTTGAGCTTGCCATA
CTTTTGTGTTTTGACGTTTGATAATAATACTATGAAAAATTATGTTTTTCTTTTGTGTGTTG
GTGTTTTTGAAGTTGTTTTTGATAAGCAGAACCCAGTTGTTTTACACTTTTACCATTGAACTA
CTGCAATTCTAAAACTTTGTGTTACATTTTAATTCCATCAAAGATTGAGTTCAGCATAGGAAAA
AGGATGGAGGATGCTAATCATGATAGTGTGGCATCTGCGCACTCTGCAGCATTCAAAAAGTCG
M E D A N H D S V A S A H S A A F K K S
GAGAATTTAGAGGGGAAAAGCGTTAAGATTGAGGGTTATGATTTTAATCAAGGTGTAACTAT
E N L E G K S V K I E G Y D F N Q G V N Y
TCCAACTCTTGCAATCTTCGCTTCTAATGGGTTTCAAGCCTCGAATCTTGGAGATGCCATT
S K L L Q S F A S N G F Q A S N L G D A I
GAAGTAGTTAATCATATGCTAGATTGGAGTCTGGCAGATGAGGCACCTGTGGACGATTGTAGC
E V V N H M L D W S L A D E A P V D D C S
GAGGAAGAGAGGGATCCTAAATTCAGAGAATCTGTGAAGTGCAAAGTGTCTTGGGCTTTACT
E E E R D P K F R E S V K C K V F L G F T
TCAAATCTTATTTCTCTGGTGTTCGTGACACAATTCGGTATCTCGTGCAACATCATATGGTT
S N L I S S G V R D T I R Y L V Q H H M V
GACGTGATAGTAACGACAACCGGAGGTATAGAAGAAGATCTAATAAAAGGAAGATCCATCAAG
D V I V T T T G G I E E D L I K G R S I K
TGCCTTGACCCCACTTTCAAAGGCGATTTTGCCTTACCAGGAGCTCAATTACGCTCCAAAGGG
C L A P T F K G D F A L P G A Q L R S K G
TTGAATCGAATTGGTAATCTGTTGGTTCGAATGATACTACTGTAAATTTGAGGATTGGATC
L N R I G N L L V P N D N Y C K F E D W I
ATTCCAATTTTAGATAAGATGTTGGAAGAGCAAATTTTCAAGAGAAAATCTTATGGACACCATCG
I P I L D K M L E E Q I S E K I L W T P S
AAGTTGATTGGTCGATTAGGAAGAGAAAATAAACGATGAGAGTTCATACCTTTACTGGGCCTTC
K L I G R L G R E I N D E S S Y L Y W A F
AAGAACAATATTCCAGTATTTTGCCAGGTTTAACAGACGGCTCACTCGGAGACATGCTATAT
K N N I P V F C P G L T D G S L G D M L Y
TTTCATTCTTTTCGAATCCGGGTTTAATCGTCGATGTTGTGCAAGATATAAGAGCAGTAAAT
F H S F R N P G L I V D V V Q D I R A V N
GGCGAGGCTGTGCACGCAGCGCCTAGGAAAACAGGCATGATTATACTCGGTGGAGGGTTGCCT
G E A V H A A P R K T G M I I L G G G L P
AAGCACCACATCTGCAACGCAAACATGATGAGAAATGGCGCCGATTATGCTGTTTTCATCAAC
K H H I C N A N M M R N G A D Y A V F I N
ACTGCCGAAGAGTTTGACGGCAGTGATTCTGGTGCTCGCCCCGATGAGGCTATTTTCATGGGGC
T A E E F D G S D S G A R P D E A I S W G
AAAATTAGCGGATCTGCTAAGACTGTGAAGGTGCATTGTGATGCCACGATAGCTTTCCCTCTA
K I S G S A K T V K V H C D A T I A F P L
CTAGTCGCTGAGACATTTGCAGCAAAAAGAGAAAAAGAGAGGAAGAGCTGTTAAACTTTTTT
L V A E T F A A K R E K E R K S C
GATTGTTGAAAAATCTGTGTTATACAAGTCTCGAAATGCATTTTAGTAATTGACTTGATCTTA
TCATTTCAATGTGTTATCTTTGAAATGTTGGTAATGAAACATCTCACCTCTTCTATACAACA
TTGTTGATCCATTGTACTCCGTATCTTGTAAATTTTGGAAAAAAAACCGTCTATTGTTACGA
GAGAGTACATTTTTGAGGTAAAAATATAGGATTTTTGTGCGATGCAATGCTGGTTATTCCT
TGAAAAAAAACCTGTTTATTTT

(1384 bps, not include Poly A tail and 5'end nocoding region.
373 Amino Acid.)

FIG.10



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Northern Analysis of WT AT Aging Leaves

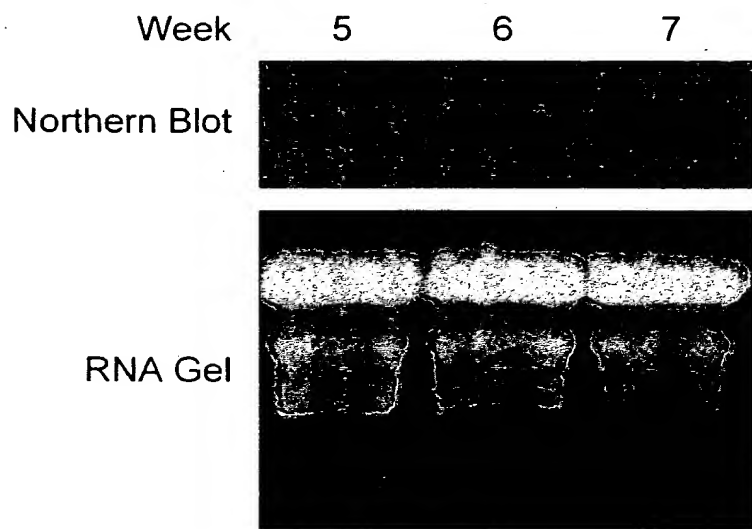


FIG.11



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Northern Analysis of Canation Petal (*In Situ*) DHS

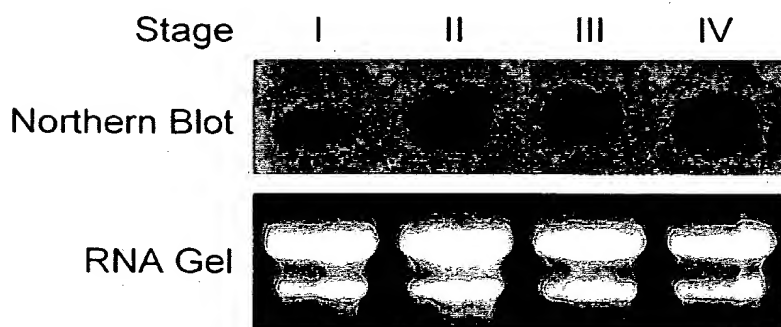


FIG.12



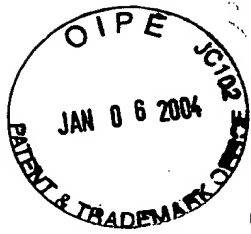
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Tomato eif5A

AAAGAATCCTAGAGAGAGAAAAGGGAATCCTAGAGAGAGAAGCATGTCGGACGAAGAACAC
M S D E E H
CATTTTGAGTCAAAGGCAGATGCTGGTGCCTCAAAAACCTTCCCACAGCAAGCTGGAACC
H F E S K A D A G A S K T F P Q Q A G T
ATCCGTAAGAATGGTTACATCGTTATCAAAGGCCGTCCCTGCAAGGTTGTTGAGGTCTCC
I R K N G Y I V I K G R P C K V V E V S
ACTTCAAAAACCTGGAAAACACGGACATGCTAAATGTCACCTTGTGGCAATTGACATTTTC
T S K T G K H G H A K C H F V A I D I F
AATGGAAGAAACTGGAAGATATCGTTCCGTCCTCCACAATTGTGATGTGCCACATGTT
N G K K L E D I V P S S H N C D V P H V
AACCGTACCGACTATCAGCTGATTGATATCTCTGAAGATGGTTTTGTCTCACTTCTTACT
N R T D Y Q L I D I S E D G F V S L L T
GAAAGTGGAACACCAAGGATGACCTCAGGCTTCCACCGATGAAAATCTGCTGAAGCAG
E S G N T K D D L R L P T D E N L L K Q
GTTAAAGATGGGTTCCAGGAAGGAAAGGATCTTGTGGTGTCTGTTATGTCTGCGATGGGC
V K D G F Q E G K D L V V S V M S A M G
GAAGAGCAGATTAACGCCGTTAAGGATGTTGGTACCAAGAATTAGTTATGTCATGGCAGC
E E Q I N A V K D V G T K N
ATAATCACTGCCAAAGCTTTAAGACATTATCATATCCTAATGTGGTACTTTGATATCACT
AGATTATAAACTGTGTTATTTGCACTGTTCAAACAAAAGAAAAGAAAAGCTGCTGTTATGG
CTAGAGAAAGTATTGGCTTTGAGCTTTTGACAGCACAGTTGAAGTATGTGAAAATTCTAC
TTTTTTTTTTTTGGGTAAAATACTGCTCGTTTAATGTTTTGCAAAAAAAAAAAAAAAAAAAAA

764 bps, not: including Poly(A) tail; 160 amino acids

FIG.13



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Carnation-F5A

CTCTTTTACATCAATCGAAAAAAAAATTAGGGTCTTATTTTAGAGTGAGA
GGCGAAAAATCGAACGATGTCGGACGACGATCACCATTTTCGAGTCATCGG
M S D D D H H F E S S A
CCGACGCCGGAGCATCCAAGACTTACCCTCAACAAGCTGGTACAATCCGC
D A G A S K T Y P Q Q A G T I R
AAGAGCGGTACATCGTCATCAAAAATCGcCctTGCAAGGtGGTTGAGGT
K S G H I V I K N R P C K V V E V
TTCTACCTCCAAGACTGGCAAGCACGGTCATGCCAAATGTCACTTTGTTG
S T S K T G K H G H A K C H F V A
CCATTGACATTTTCAACGGCAAGAAGCTGGAAGATATTGTCCCCTCATCC
I D I F N G K K L E D I V P S S
CACAATTGTGATGTTCCACATGTCAACCGTGTGACTACCAGCTGCTTGA
H N C D V P H V N R V D Y Q L L D
TATCACTGAAGATGGCTTTCTTAGTCTGCTGACTGACAGTGGTGACACCA
I T E D G F V S L L T D S G D T K
AGGATGATCTGAAGCTTCCTGCTGATGAGGCCCTTGTGAAGCAGATGAAG
D D L K L P A D E A L V K Q M K
GAGGGATTTGAGGCGGGGAAAGACTTGATTCTGTCAGTCATGTGTGCAAT
E G F E A G K D L I L S V M C A M
GGGAGAAGAGCAGATCTGCGCCGTCAAGGACGTTAGTGGTGGCAAGTAGA
G E E Q I C A V K D V S G G K
AGCTTTTGATGAATCCAATACTACGCGGTGCAGTTGAAGCAATAGTAATC
TCGAGAACATTCTGAACCTTATATGTTGAATTGATGGTGCTTAGTTTGTT
TTGGAAATCTCTTTGCAATTAAGTTGTACCAAATCAATGGATGTAATGTC
TTGAATTTGTTTTATTTTTGTTTTGATGTTTGCTGtGATTGCATTATGCA
TTGTTATGAGTTATGACCTGTTATAACACAAGGTTTTGGTAAAAAAAAA
AAAAAAAAAAAA

790 bps, 160 amino acids

FIG.14



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Arabidopsis F5A

CTGTTACCAAAAAATCTGTACCGCAAAATCCTCGTCGAAGCTCGCTGCTGCAACCATGTC
M S
CGACGAGGAGCATCACTTTGAGTCCAGTGACGCCGAGCGTCCAAAACCTACCCTCAACA
D E E H H F E S S D A G A S K T Y P Q Q
AGCTGGAACCATCCGTAAGAATGGTTACATCGTCATCAAAATCGTCCCTGCAAGGTTGT
A G T I R K N G Y I V I K N R P C K V V
TGAGGTTTCAACCTCGAAGACTGGCAAGCATGGTCATGCTAAATGTCATTTTGTAGCTAT
E V S T S K T G K H G H A K C H F V A I
TGATATCTTCACCAGCAAGAACTCGAAGATATTGTTCTTCTCCACAATTGTGATGT
D I F T S K K L E D I V P S S H N C D V
TCCTCATGTCAACCGTACTGATTATCAGCTGATTGACATTTCTGAAGATGGATATGTCAG
P H V N R T D Y Q L I D I S E D G Y V S
TTTGTTGACTGATAACGGTAGTACCAAGGATGACCTTAAGCTCCCTAATGATGACACTCT
L L T D N G S T K D D L K L P N D D T L
GCTCCAACAGATCAAGAGTGGGTTTGATGATGGAAAAGATCTAGTGGTGAGTGTAATGTC
L Q Q I K S G F D D G K D L V V S V M S
AGCTATGGGAGAGGAACAGATCAATGCTCTTAAGGACATCGGTCCCAAGTGAGACTAACA
A M G E E Q I N A L K D I G P K
AAGCCTCCCCTTTGTTATGAGATTCTTCTTCTTCTGTAGGCTTCCATTACTCGTCGGAGA
TTATCTTGTTTTGGGTTACTCCTATTTTGGATATTTAACTTTTGTTAATAATGCCATC
TTCTTCAACCTTTTCCTTCTAGATGGTTTTTATACTTCTTCT

754 bps, not including Poly(A) tail; 158 amino acids

FIG.15



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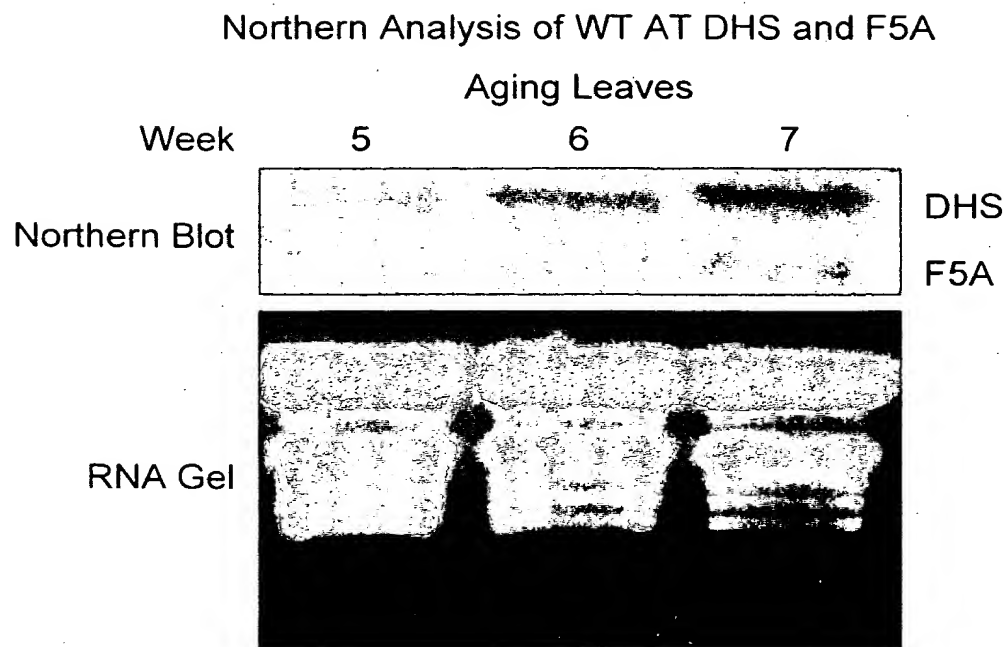


FIG.16



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Northern Analysis of Ripening Tomato Fruit

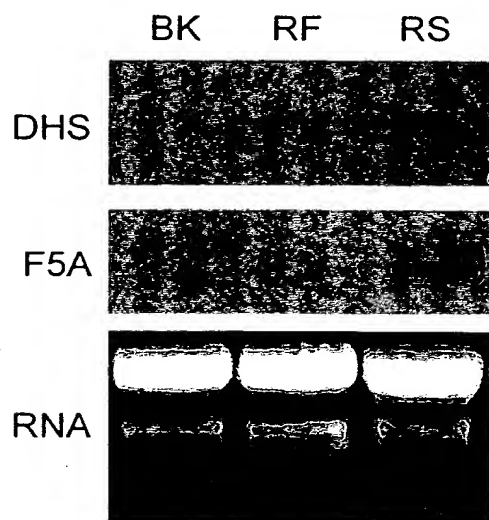
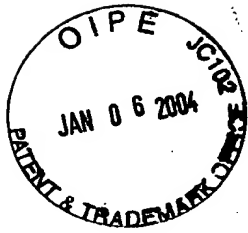


FIG.17



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Northern Analysis of sorbitol-treated tomato leaves

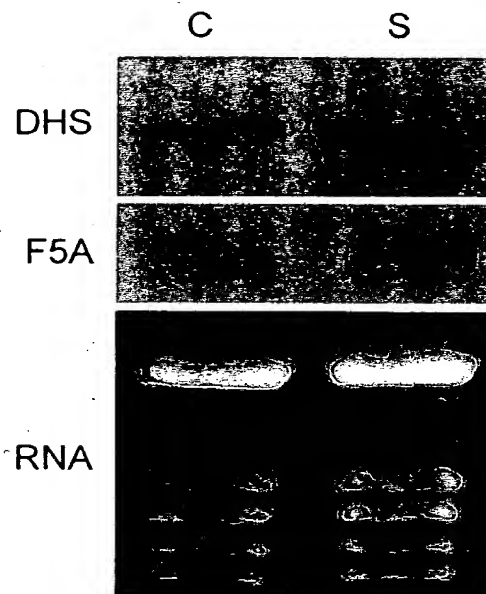


FIG.18



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Northern Analysis of Tomato Flowers

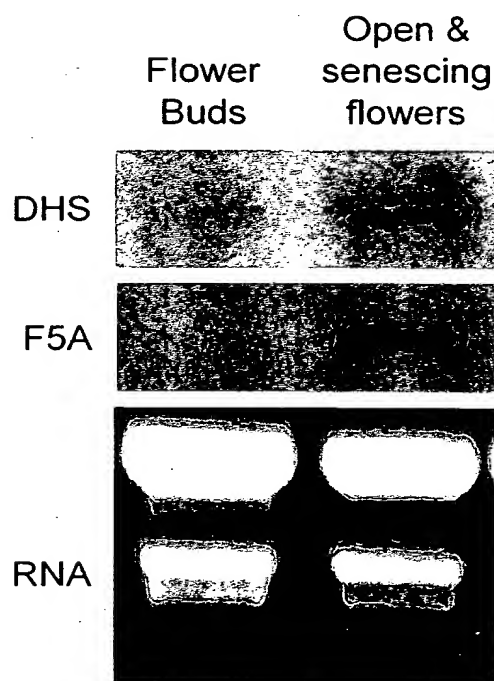


FIG.19



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Northern Analysis of chill-injured tomato leaves

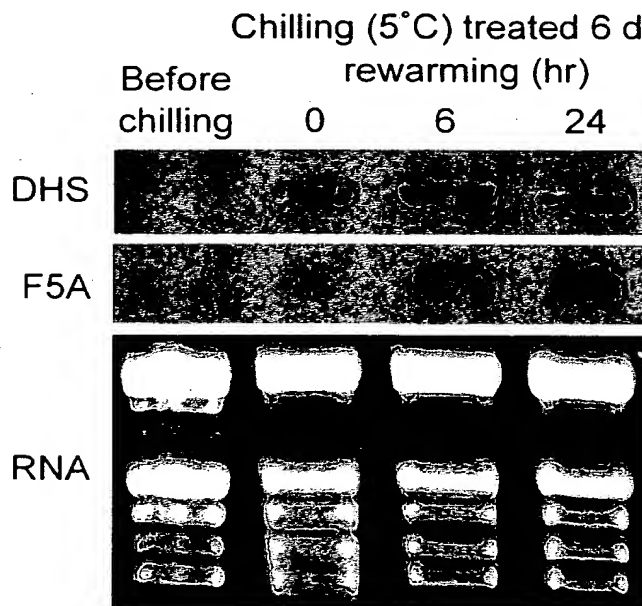


FIG.20



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3.1 Weeks



α -3'DHS #3

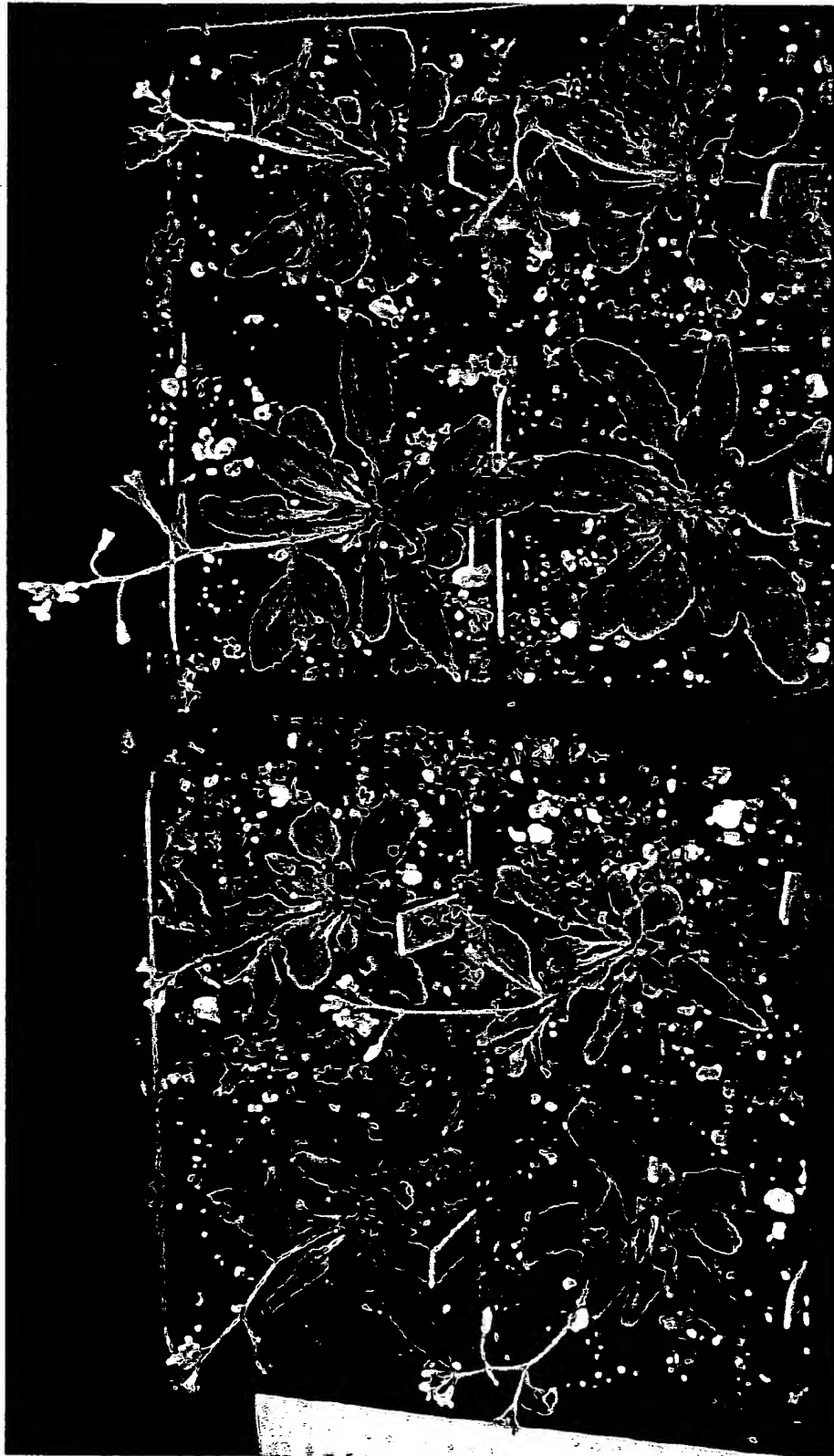
Wild-Type

FIG.21



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4.6 Weeks



Wild-Type

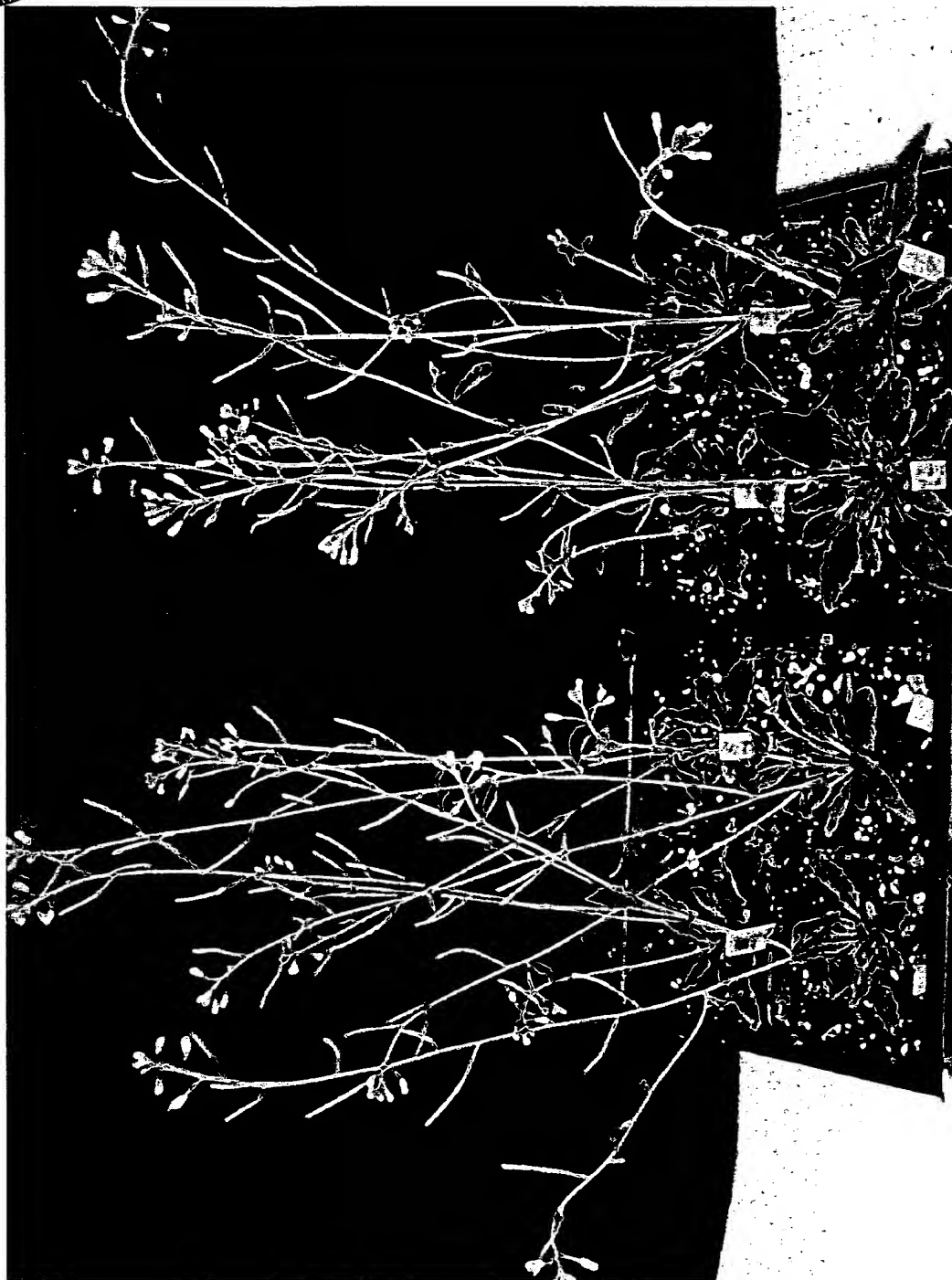
α -3'DHS #3

FIG.22



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5.6 Weeks



α-3'DHS #7

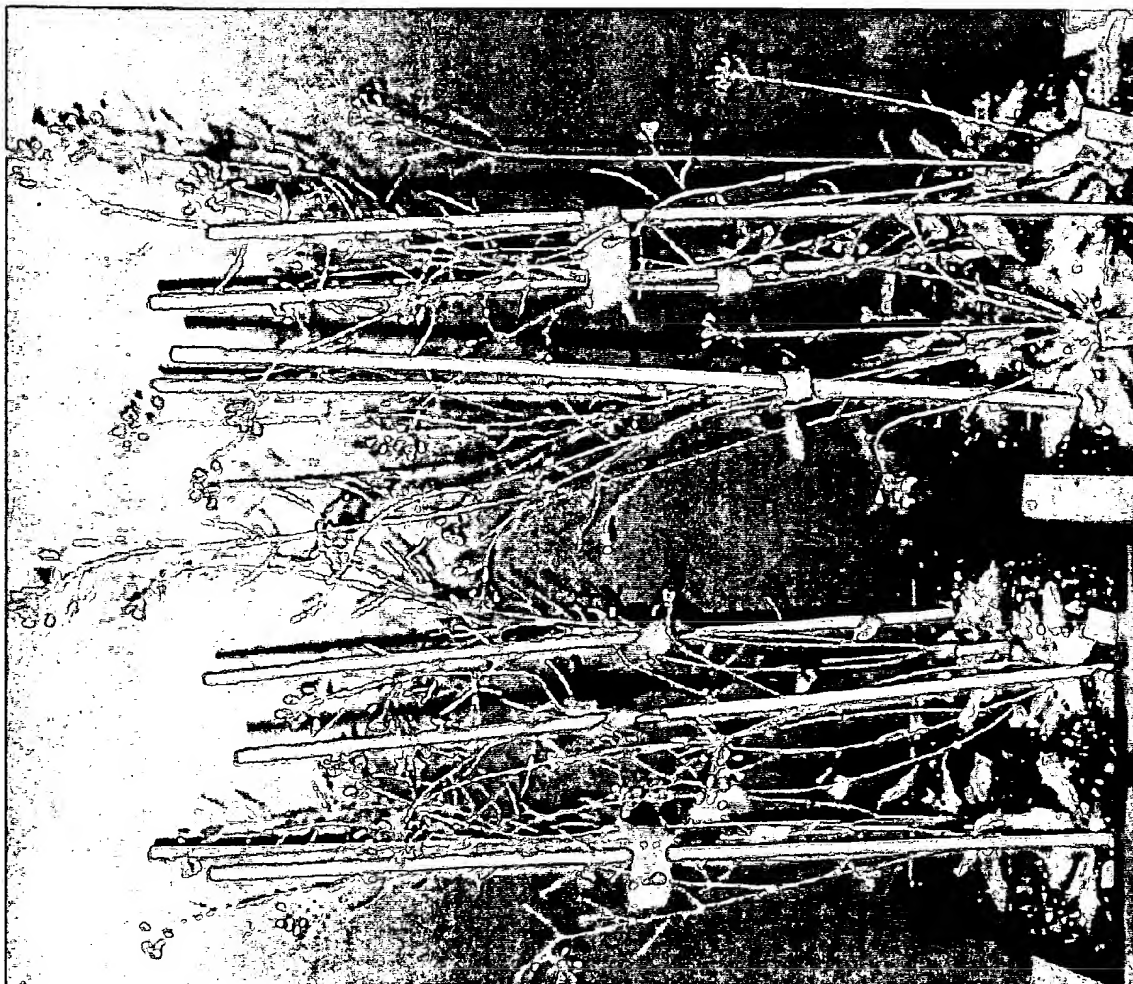
Wild-Type

FIG. 23



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6.1 Weeks



α-3'DHS #7

Wild-Type

FIG. 24



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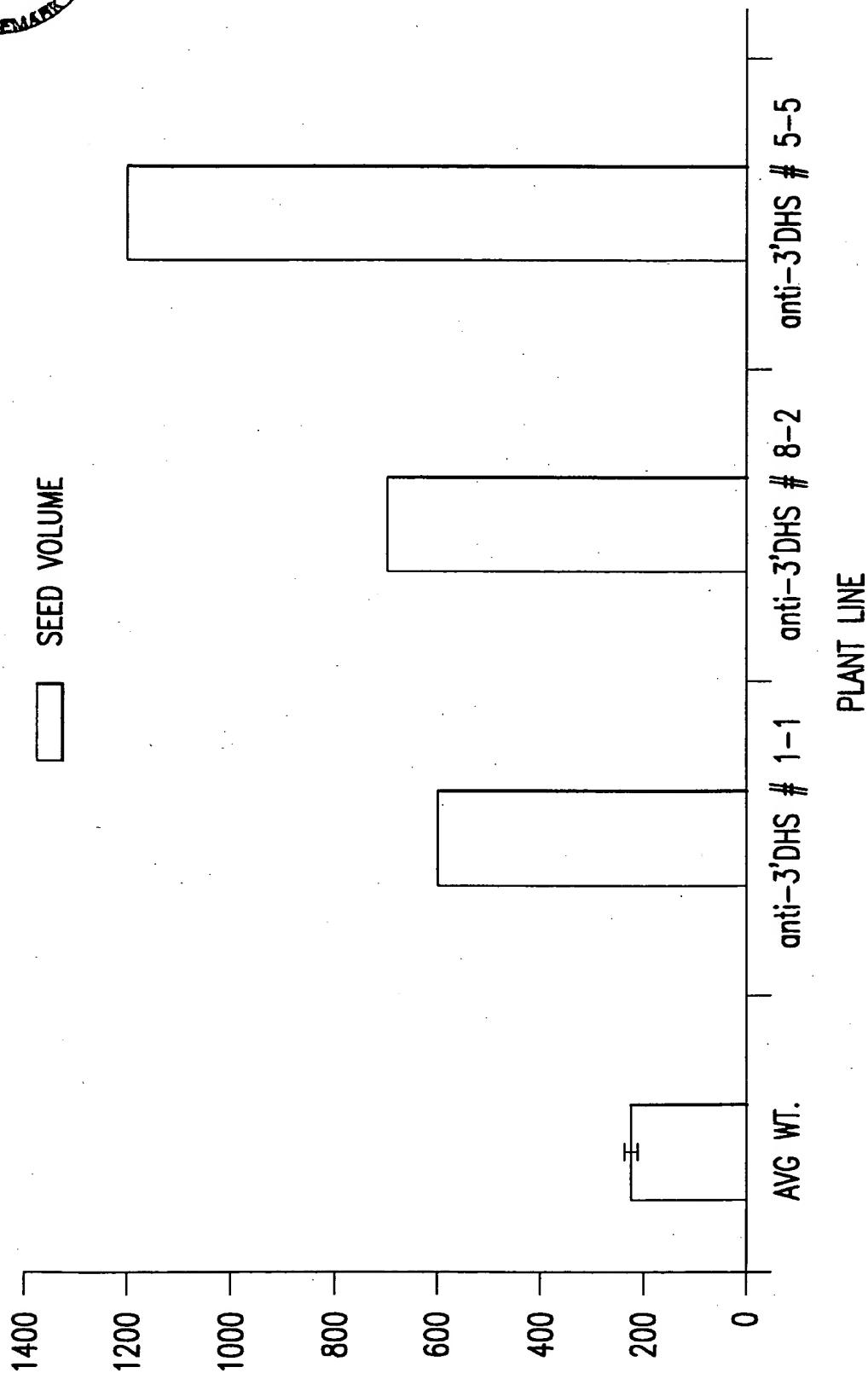


FIG.25



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FIG.26



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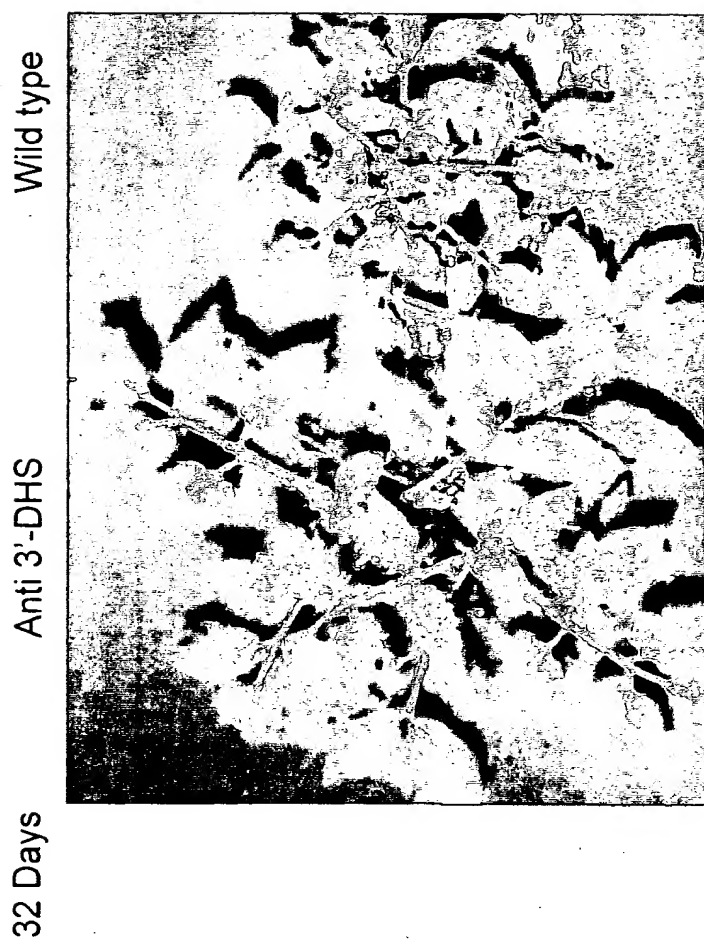


FIG.27

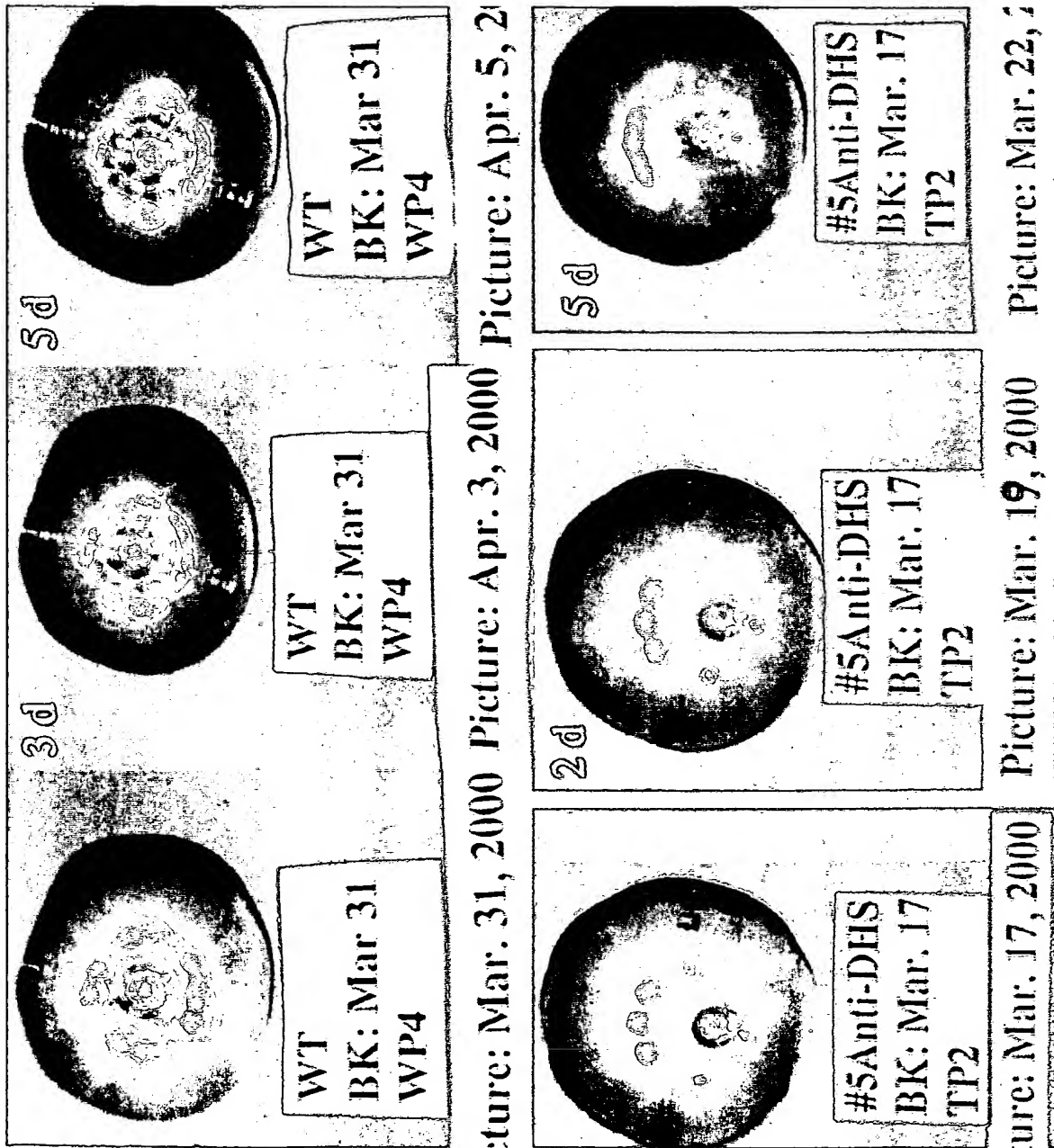


FIG.28



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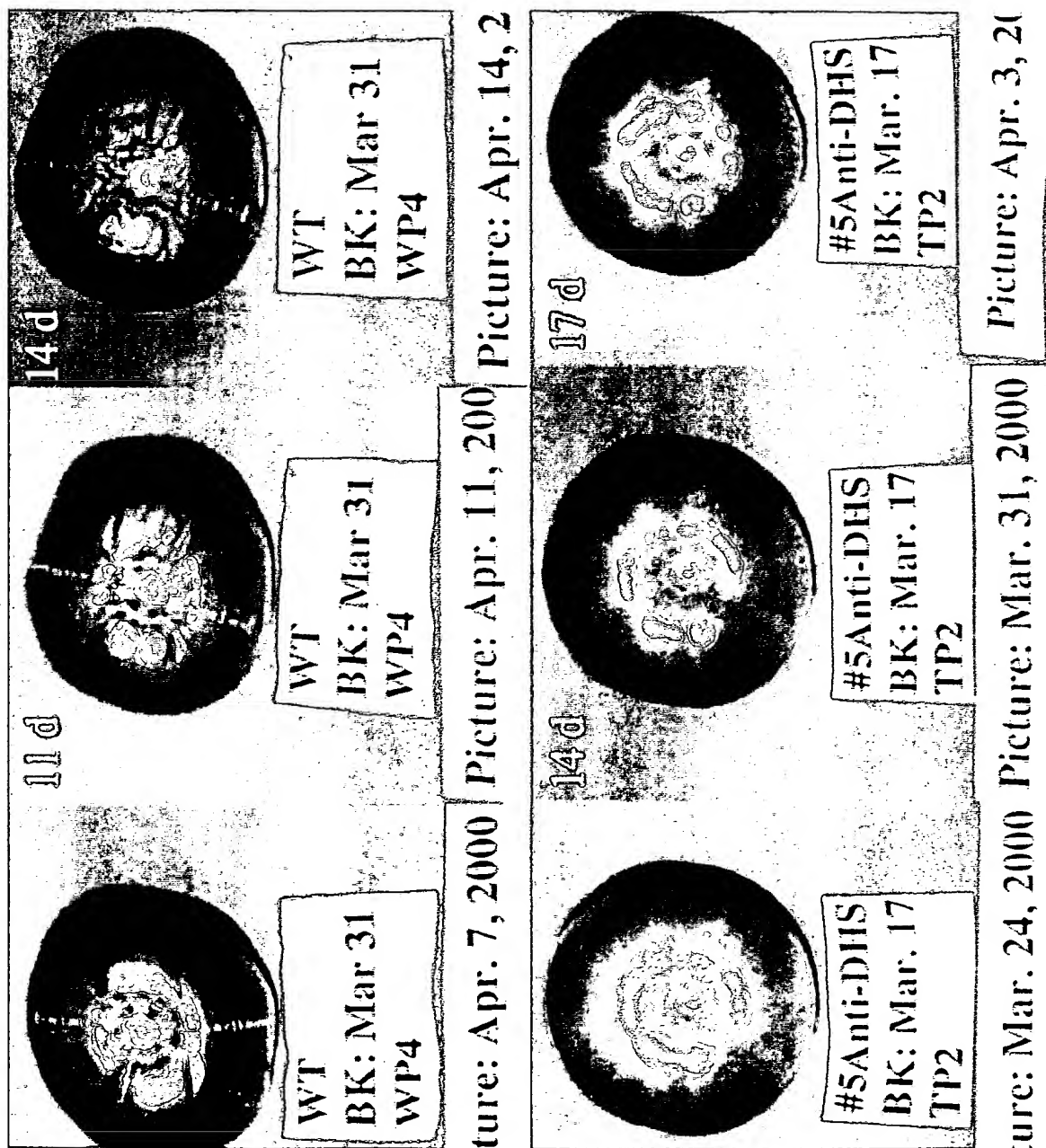


FIG.29



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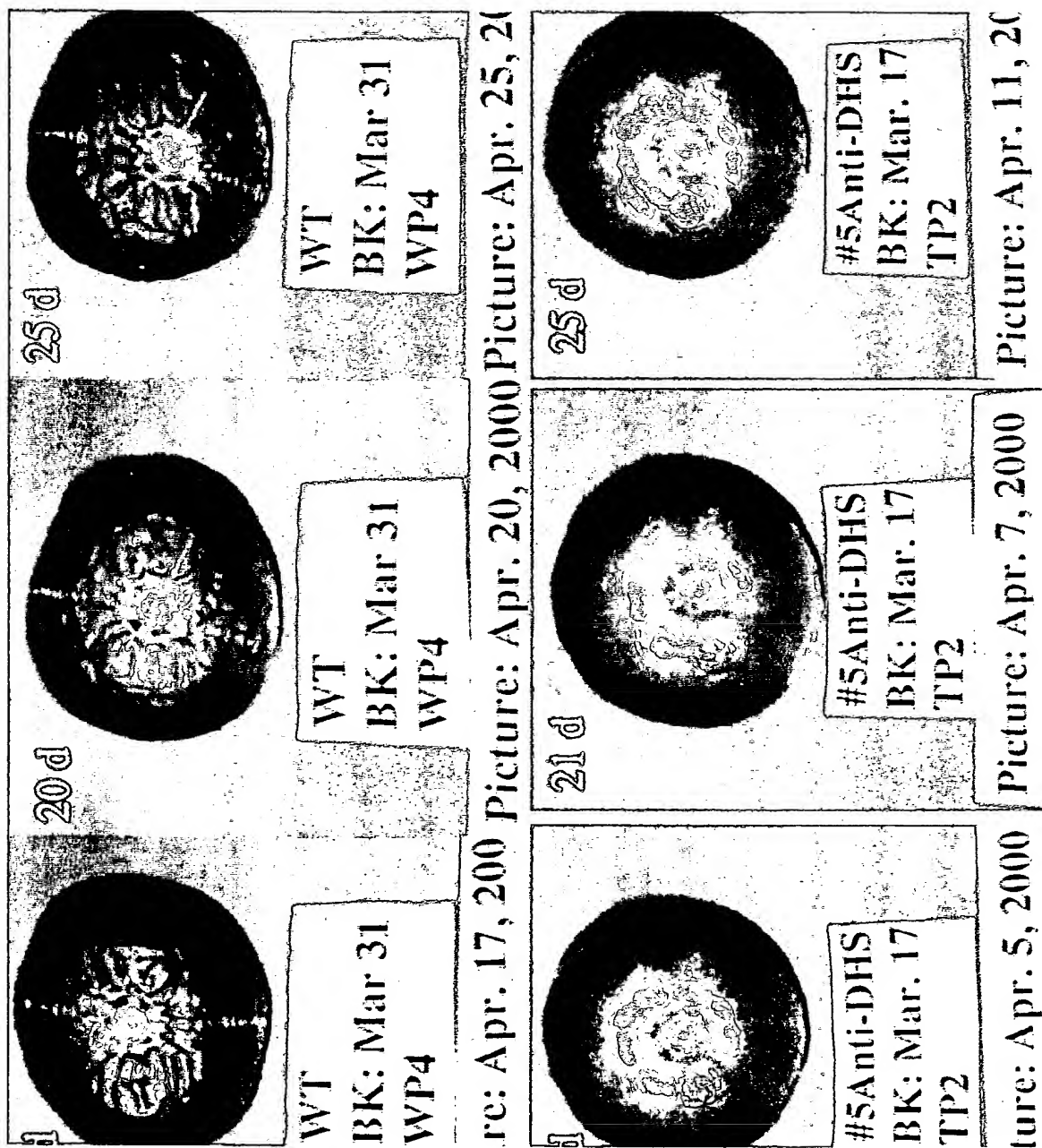


FIG.30

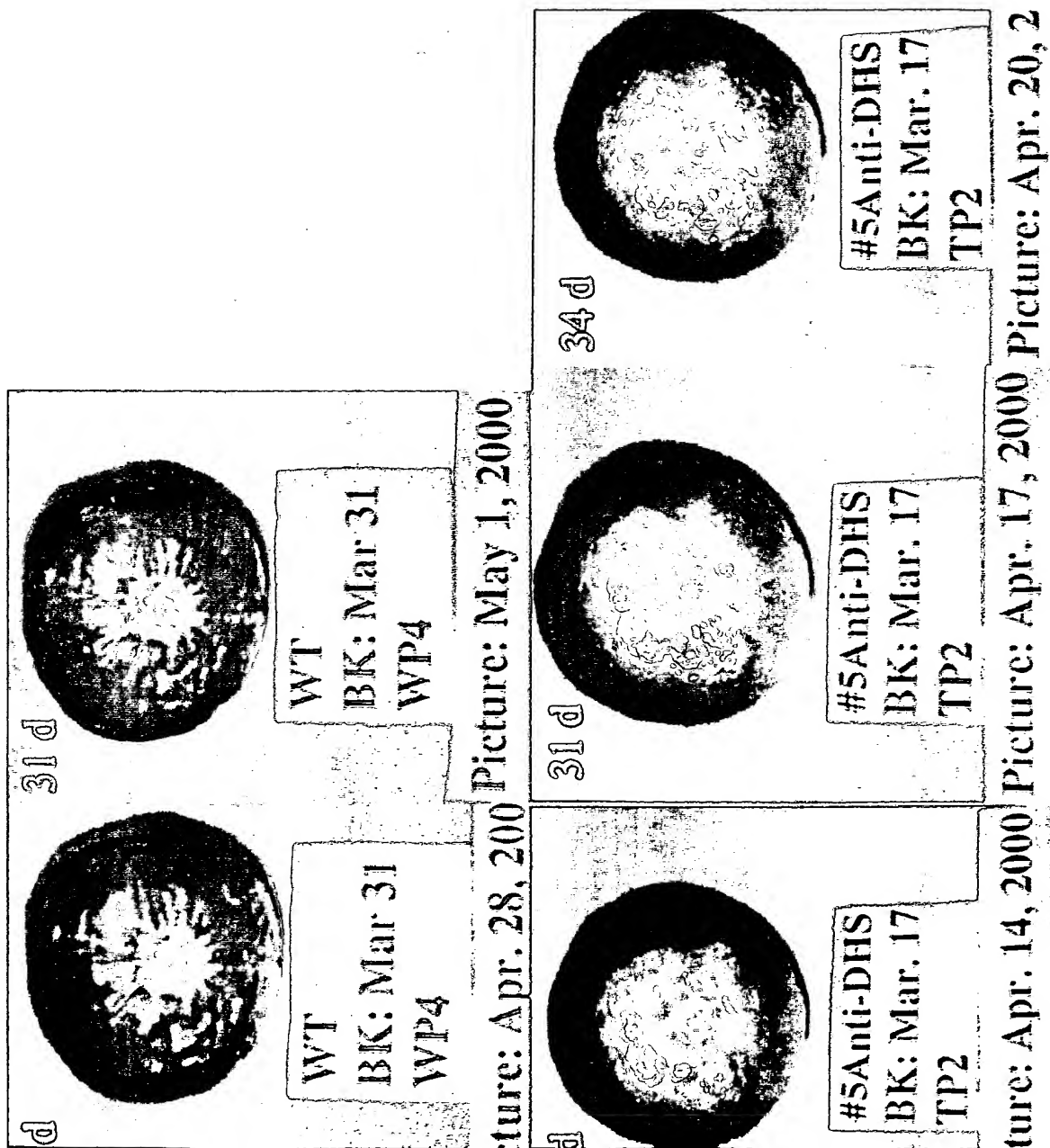


FIG.31

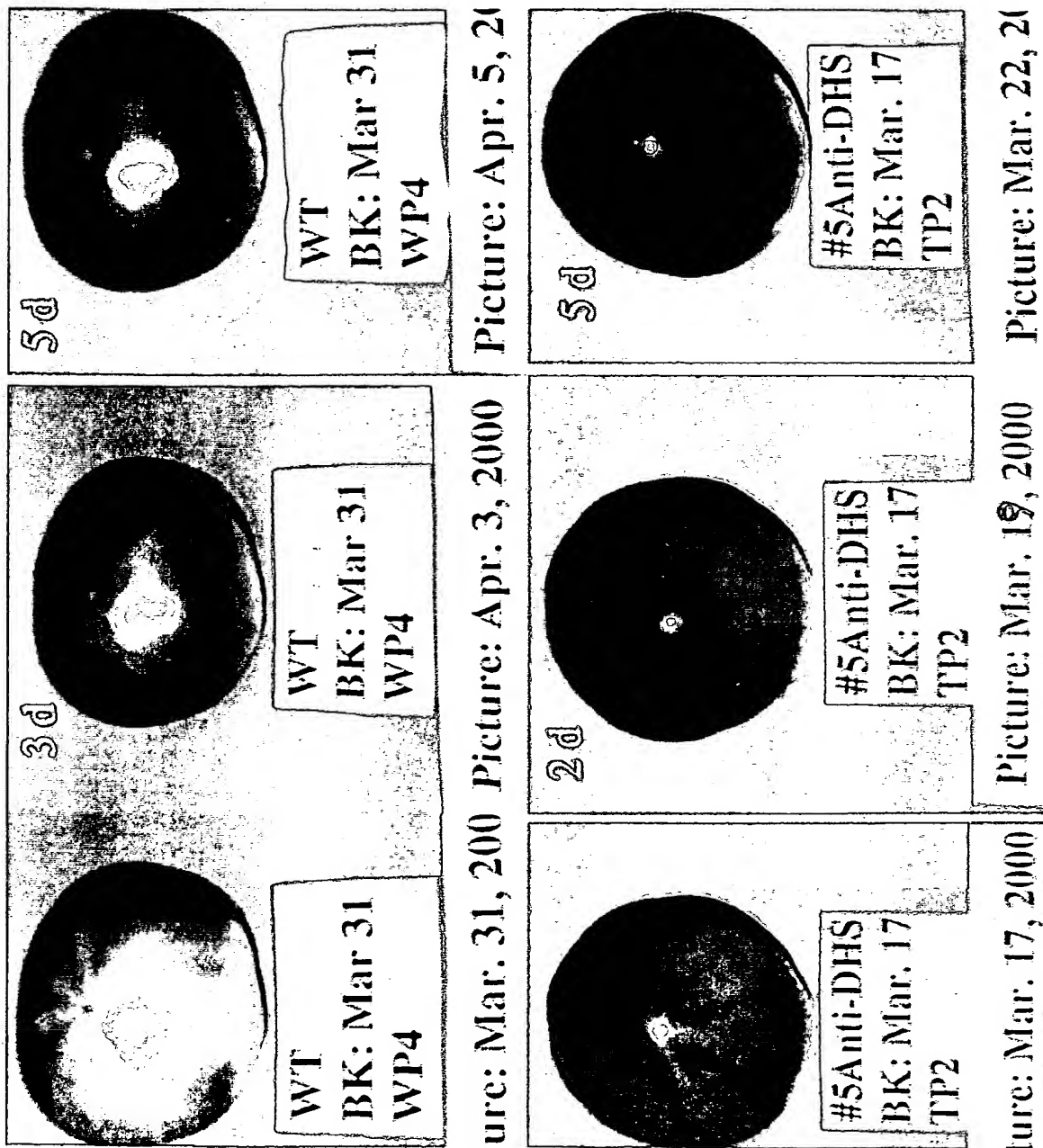


FIG.32

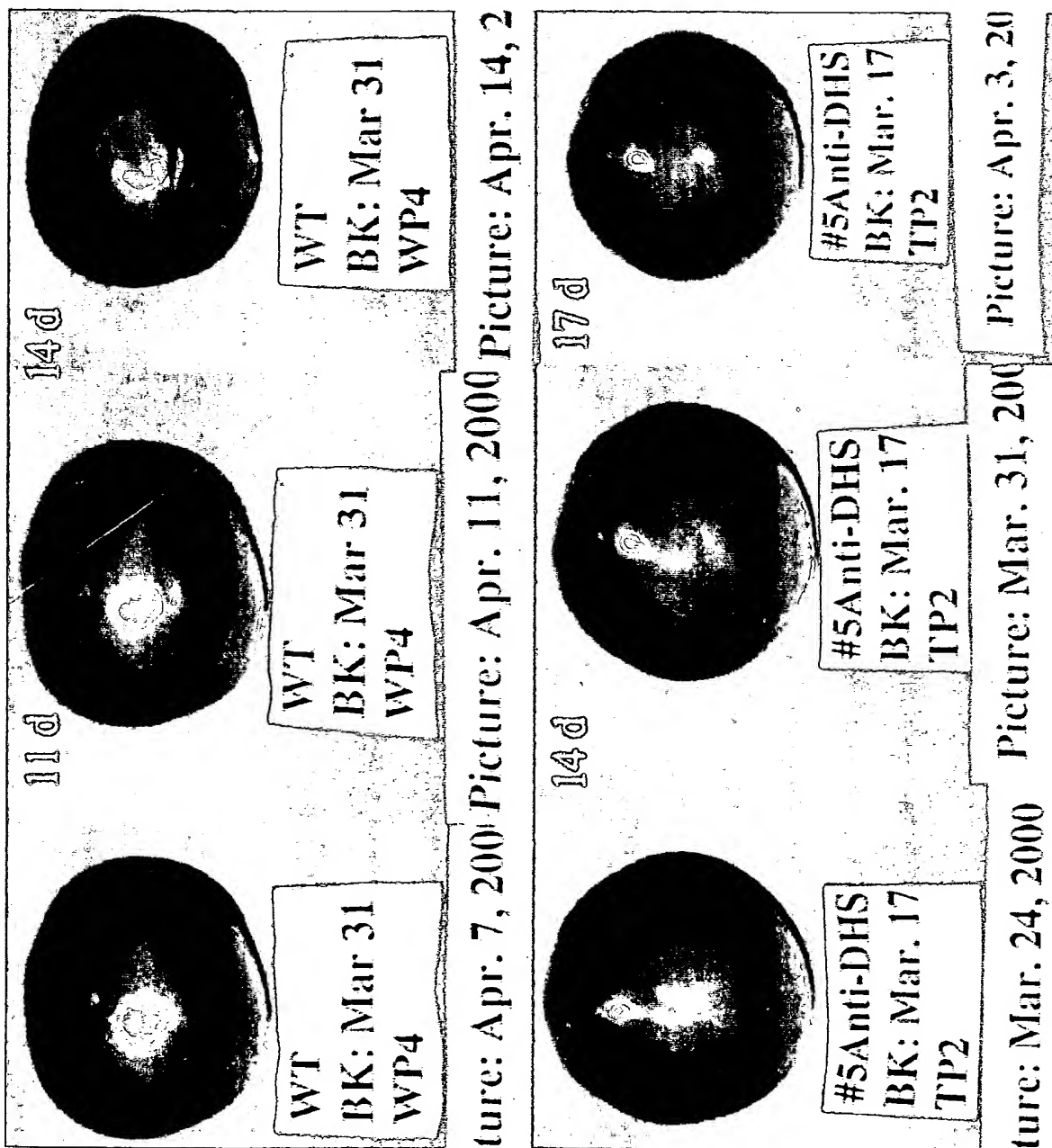


FIG.33



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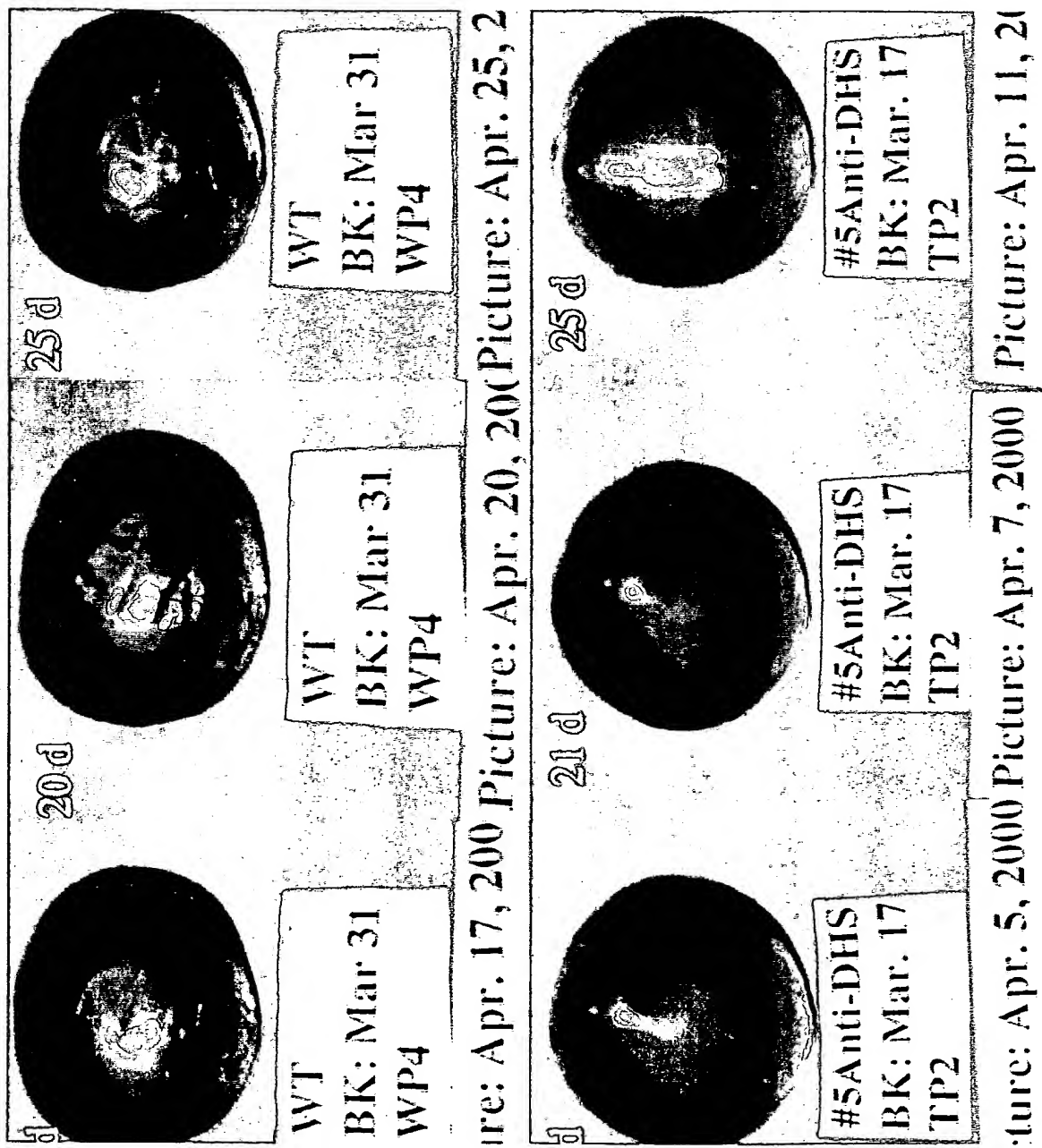


FIG.34

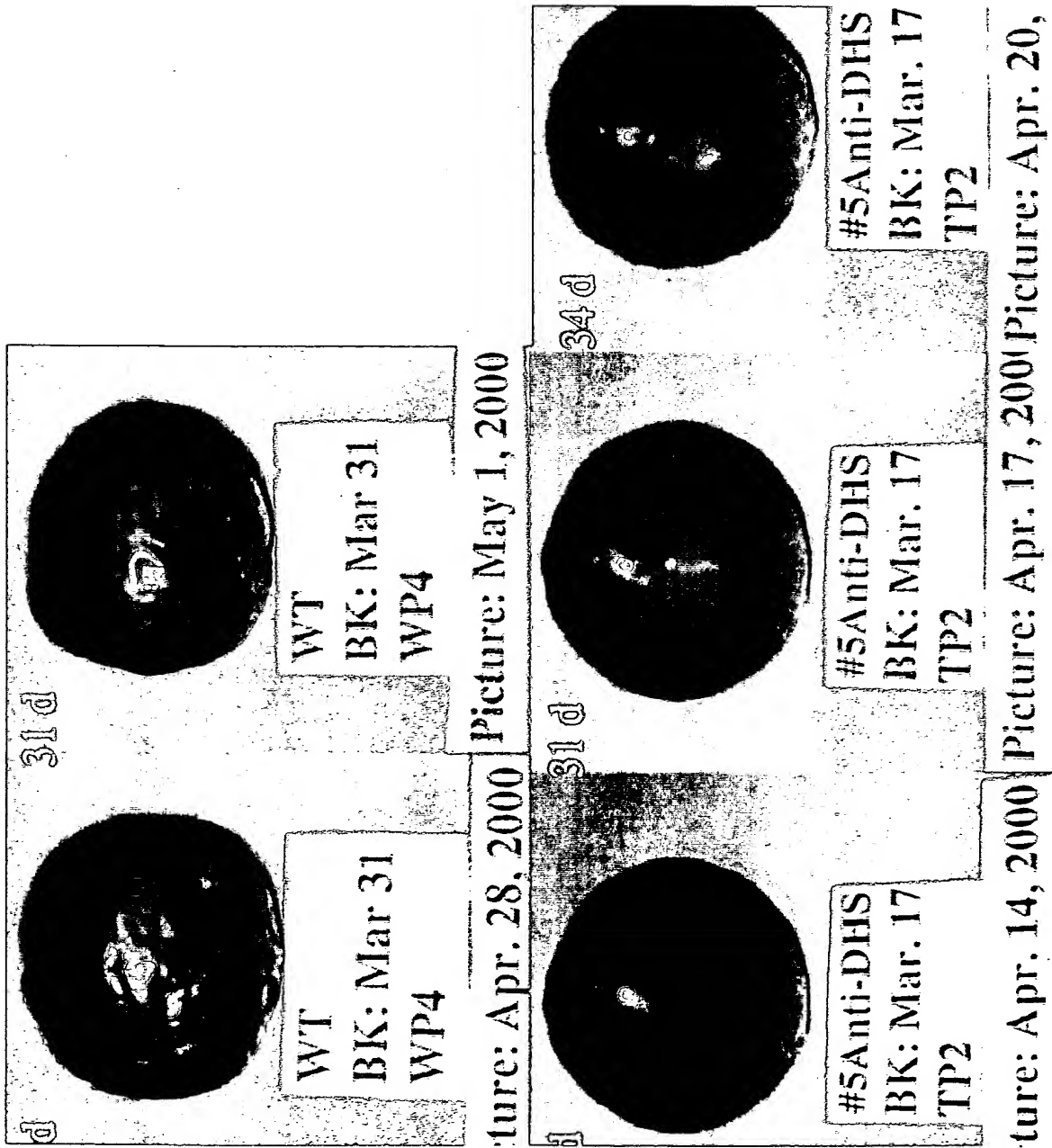


FIG.35



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Arabidopsis 3'-end DHS for antisense

Nucleotide and derived amino acid sequence

TGCACGCCCTGATGAAGCTGTGTCTTGGGGTAAAATTAGGGGTTCTGCTAAAACCGTTAAGGTCTGCTTTT
A R P D E A V S W G K I R G S A K T V K V C F

TAATTTCTTCACATCCTAATTTATATCTCACTCAGTGGTTTTGAGTACATATTTAATATTGGATCATTCTT
L I S S H P N L Y L T Q W F

GCAGGTATACTGTGATGCTACCATAGCCTTCCCATTGTTGGTTGCAGAAACATTTGCCACAAAGAGAGACC
AAACCTGTGAGTCTAAGACTTAAGAACTGACTGGTCGTTTTGGCCATGGATTCTTAAAGATCGTTGCTTTT
TGATTTTACACTGGAGTGACCATATAACACTCCACATTGATGTGGCTGTGACGCGAATTGTCTTCTTGCGA
ATTGTACTTTAGTTTCTCTCAACCTAAAATGATTTGCAGATTGTGTTTTCGTTTAAAACACAAGAGTCTTG
TAGTCAATAATCCTTTGCCTTATAAAATTATTCAGTTCCAACAAAAAAAAAAAAAAAAAAAA

.....
Nucleotide sequence

TGCACGCCCTGATGAAGCTGTGTCTTGGGGTAAAATTAGGGGTTCTGCTAAAACCGTTAAGGTCTGCTTTT
TAATTTCTTCACATCCTAATTTATATCTCACTCAGTGGTTTTGAGTACATATTTAATATTGGATCATTCTT
GCAGGTATACTGTGATGCTACCATAGCCTTCCCATTGTTGGTTGCAGAAACATTTGCCACAAAGAGAGACC
AAACCTGTGAGTCTAAGACTTAAGAACTGACTGGTCGTTTTGGCCATGGATTCTTAAAGATCGTTGCTTTT
TGATTTTACACTGGAGTGACCATATAACACTCCACATTGATGTGGCTGTGACGCGAATTGTCTTCTTGCGA
ATTGTACTTTAGTTTCTCTCAACCTAAAATGATTTGCAGATTGTGTTTTCGTTTAAAACACAAGAGTCTTG
TAGTCAATAATCCTTTGCCTTATAAAATTATTCAGTTCCAACAAAAAAAAAAAAAAAAAAAA

ARPDEAVSWGKIRGSAKTVKVCFLISSHPNLYLTQWF

FIG.36

Tomato 3'-end-Deoxyhupsine synthase used for antisense

Nucleotide and derived amino acid sequence

GGTGCCTCCTGATGAAGCTGTATCATGGGAAAGATACGTGGTGCCCAAGACTGTGAAGGTGCATTGTGTGCAAC
G A R P D E A V S W G G K I R G G A K T V K V H C D A T

CATTGCATTTCCCATATTAGTAGCTGAGACATTTGCAGCTAAGAGTAAGGAATTTCTCCAGATAAGGTGCCAAGTTTGAA
I A F P I L V A E T F A A K S K E F S Q I R C Q V

CATTGAGGAAGCTGTCTTCCGACCACACATATGAATTGCTAGCTTTTGAAGCCAACTTGCTAGTGTGCAGCACCATTTA
TTCTGCAAAACTGACTAGAGAGCAGGGTATATTCCTCTACCCCGAGTTAGACGACATCCTGTATGGTTCAAATTAAATTAT
TTTTCTCCCTTCACACCATGTTATTAGTTCCTCTCCCTTCGAAAGTGAAGAGCTTAGATGTTTCATAGGTTTGAATT
ATGTTGGAGTTGGTATAACTGACTAGTCTCTTACCATAATAGATAATGTATCCTTGACTATGAGATTTTGGGTGTGT
TTGATACCAAGGAAAAATGTTTATTGGAAAAACAATTGGATTTTAAATTTAAAAAAAATTGNTTAAAAAAAATAAAAAA

Nucleotide sequence

GGTGCCTCCTGATGAAGCTGTATCATGGGAAAGATACGTGGTGCCCAAGACTGTGAAGGTGCATTGTGTGCAAC
CATTGCATTTCCCATATTAGTAGCTGAGACATTTGCAGCTAAGAGTAAGGAATTC

TCCCAGATAAGGTGCCAAGTTTGAACATTGAGGAAGCTGTCTTCCGACCACACATATGAATTGCTAGCTTTTGAAGCCA
ACTTGTAGTGTGCAGCACCATTTATCTGCAAAACTGACTAGAGAGCAGGGTATATTCCTCTACCCCGAGTTAGACGAC
ATCCTGTATGGTTCAAATTAATTATTTTCTCCCTTCACACCATGTTATTAGTTCCTCTCCCTTCGAAAGTGAAGAG
CTTAGATGTTTCATAGGTTTGAATTATGTTGGAGTTGGTGATACTGACTAGTCTCTTACCATAATAGATAATGTATCC
TTGTAATATGAGATTTTGGGTGTGTTTGATACCAAGGAAAAATGTTTATTGGAAAAACAATTGGATTTTAAATTTAAAAA
AAATTGNTTAAAAAAAATAAAAAA

FIG.37



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600 bp Arabidopsis Deoxyhypusine Synthase Probe

Primer1 (underlined)

GGTGGTGTGAGGAAGATCTCATAAAATGCCTTGACCTACATTTAAAGGTGATTTCTCTCTACCTGGAGC
TTATTTAAG
G G V E E D L I K C L A P T F K G D F S L P G A
Y L R
GTCAAAGGGATTGAACCGAATTGGGAATTTGCTGGTTCCTAATGATAACTACTGCAAGTTTGAGGATTGGA
TCATTCCCA
S K G L N R I G N L L V P N D N Y C K F E D W I
I P
TCTTTGACGAGATGTTGAAGGAACAGAAAGAAGAGAATGTGTTGTGGACTCCTTCTAAACTGTTAGCACGG
CTGGGAAAA
I F D E M L K E Q K E E N V L W T P S K L L A R
L G K
GAAATCAACAATGAGAGTTCATACCTTTATTGGGCATACAAGATGAATATTCCAGTATTCTGCCCAGGGTT
AACAGATGG
E I N N E S S Y L Y W A Y K M N I P V F C F G L
T D G
CTCTCTTAGGGATATGCTGTATTTTCACTCTTTTCGTACCTCTGGCCTCATCATCGATGTAGTACAAGATA
TCAGAGCTA

S L R D M L Y F H S F R T S G L I I D V V Q D I
R A
TGAACGGCGAAGCTGTCCATGCAAATCCTAAAAAGACAGGGATGATAATCCTTGGAGGGGGCTTGCCAAAG
CACCACATA
M N G E A V H A N P K K T G M I I L G G G L P K
H H I
TGTAATGCCAATATGATGCGCAATGGTGCAGATTACGCTGTATTTATAAACACCGGGCAAGAATTTGATGG
GAGCGACTC
C N A N M M R N G A D Y A V F I N T G Q E F D G
S D S

GGGTGCACGCCCTGATGAAGC

G A R P D E

Primer 2 (underlined)

FIG.38



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483 bp Carnation Deoxyhypusine Synthase Probe

GAAGATCCATCAAGTGCCTTGCACCCACTTTCAAAGGCGATTTTGCCTTACCAGGAGCTCAATTACGCTCC

AAAGGGT

R R S I K C L A P T F K G D F A L P G A Q L R S
K G

TGAATCGAATTGGTAATCTGTTGGTTCCGAATGATAACTACTGTAAATTTGAGGATTGGATCATTCCAATT

TTAGATA

L N R I G N L L V P N D N Y C K F E D W I I P I
L D

AGATGTTGGAAGAGCAAATTTCAAGAGAAAATCTTATGGACACCATCGAAGTTGATTGGTCGATTAGGAAGA

GAAATAA

K M L E E Q I S E K I L W T P S K L I G R L G R
E I

ACGATGAGAGTTCATACCTTTACTGGGCCTTCAAGAACAATATTCCAGTATTTTGCCAGGTTTAACAGAC

GGCTCAC

N D E S S Y L Y W A F K N N I P V F C P G L T D
G S

TCGGAGACATGCTATATTTTCATTCTTTTCGCAATCCGGGTTTAATCATCGATGTTGTGCAAGATATAAGA

GCAGTAA

L G D M L Y F H S F R N P G L I I D V V Q D I R
A V

ATGGCGAGGCTGTGCACGCAGCGCCTAGGAAAACAGGCATGATTATACTCGGTGGAGGGTTGCCTAAGCAC

CACATCT

N G E A V H A A P R K T G M I I L G G G L P K H
H I

GCAACGCAAACATGATGAGAAATGGCGCCGATTATGCTGTTTTTCATCAACACCG

C N A N M M R N G A D Y A V F I N T

A full-length cDNA clone was obtained by screening a carnation senescing petal cDNA library with this probe.

FIG.39



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Blossom end rot

Normal

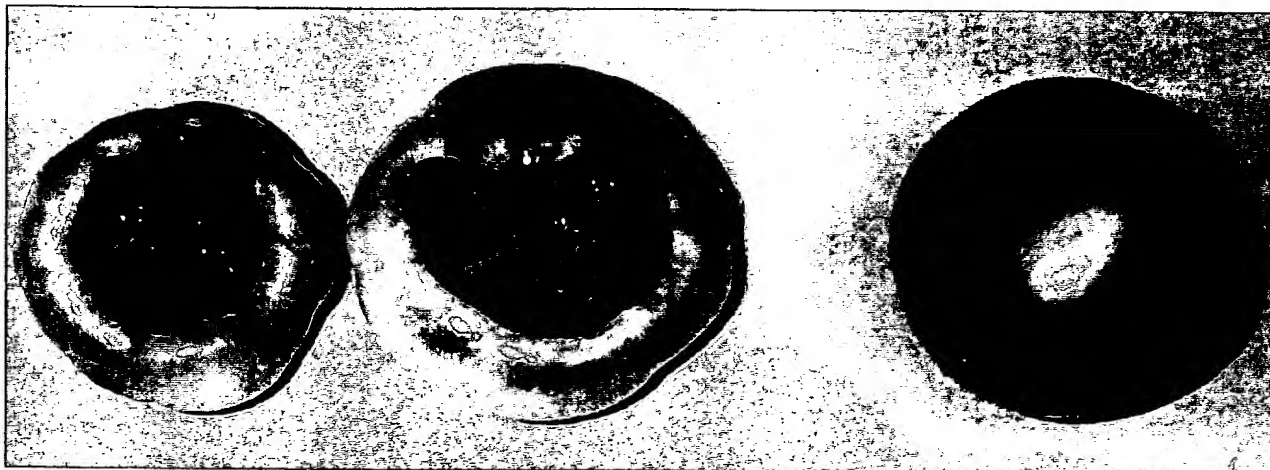


FIG.40A

Blossom end rot

Normal

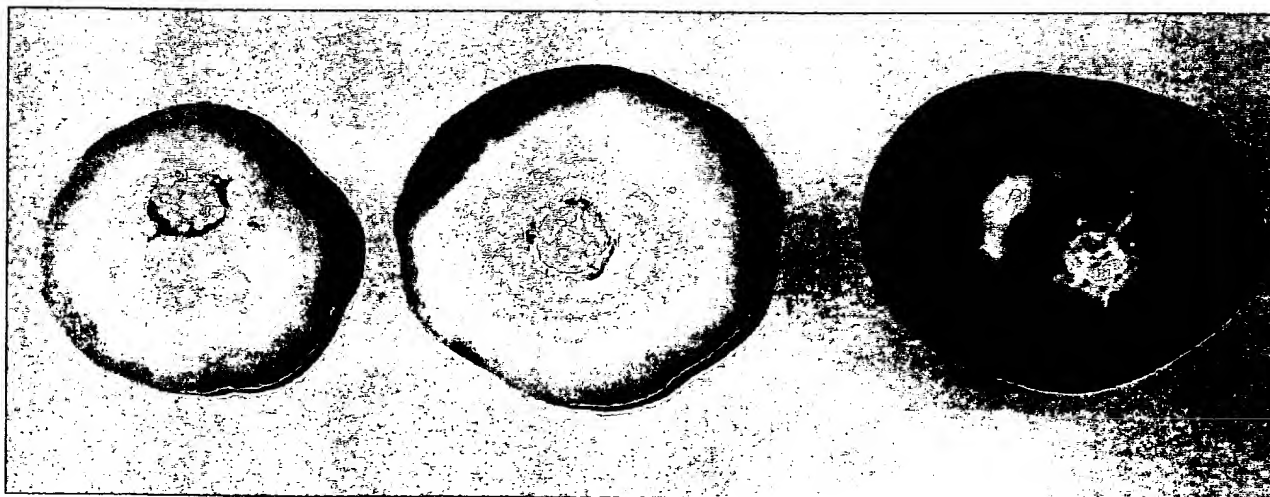


FIG.40B